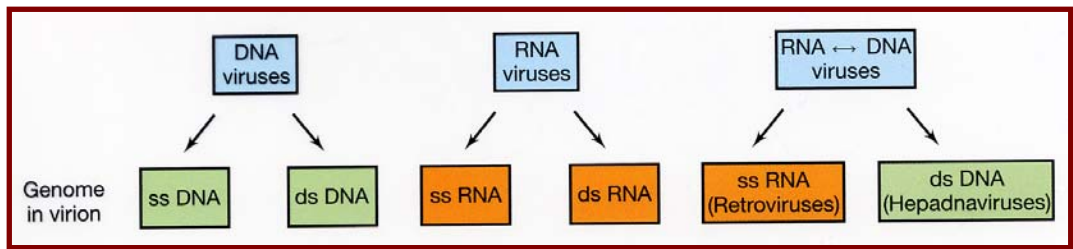


Viruses

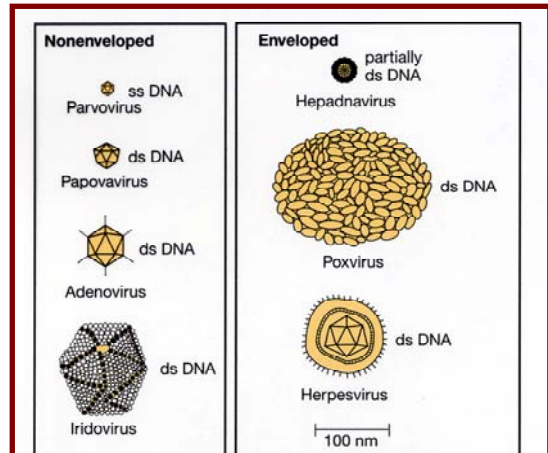
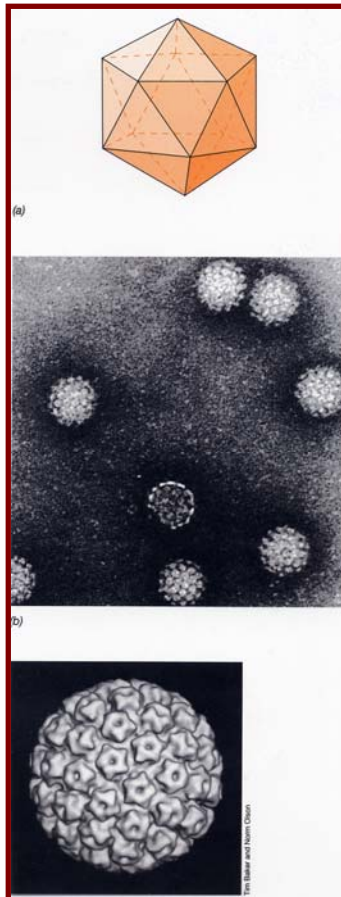
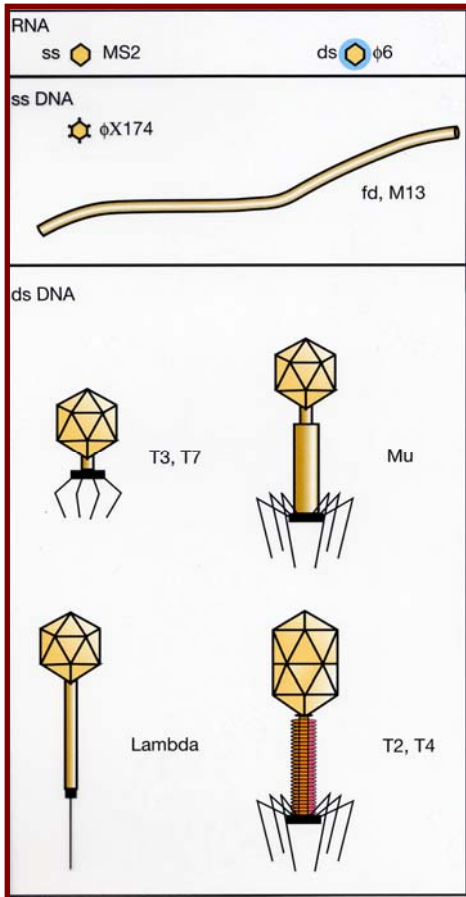
(see text pages 231-259)

- What are Viruses?
 - Genetic elements that cannot replicate independently of a host cell.
 - They are generally small
 - 0.02 → 0.3 μm
 - They are metabolically inactive in the extracellular state
 - They are host specific
 - Plant viruses
 - Animal viruses
 - Bacterial viruses (bacteriophage or phage)
 - They contain nucleic acids as the genetic information (Figure 9.1)

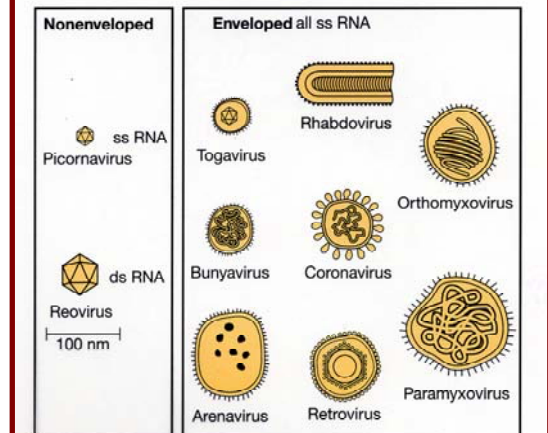


- What do they look like?
 - Very varied morphological appearance

Helical, polyhedral (icsohedral), enveloped (animal viruses), complex (many bacterial viruses)



(a) DNA viruses



(b) RNA viruses

What is their nature?

- Genetic material is encased by a protein coat...the capsid
- Capsid consists of protein sub-units known as ...capsomeres
- Together this is the nucleocapsid
- These structures may also contain enzymes

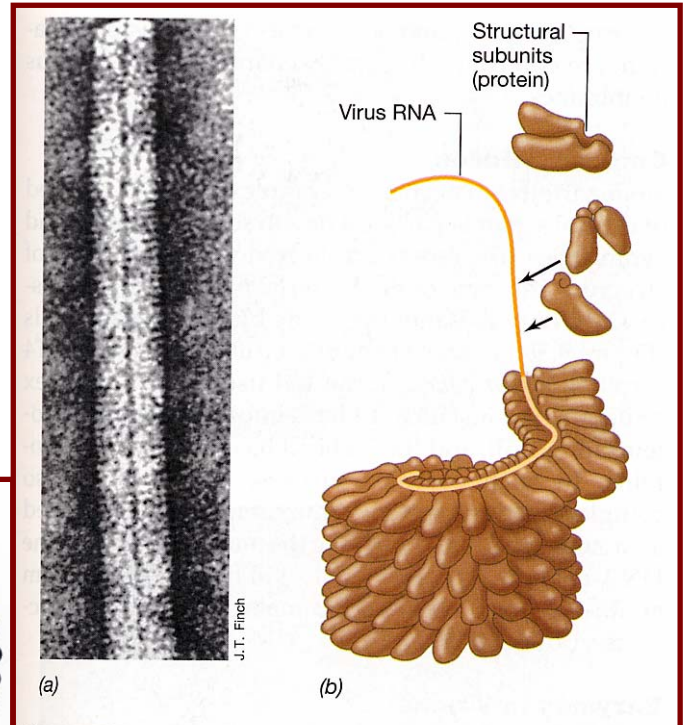
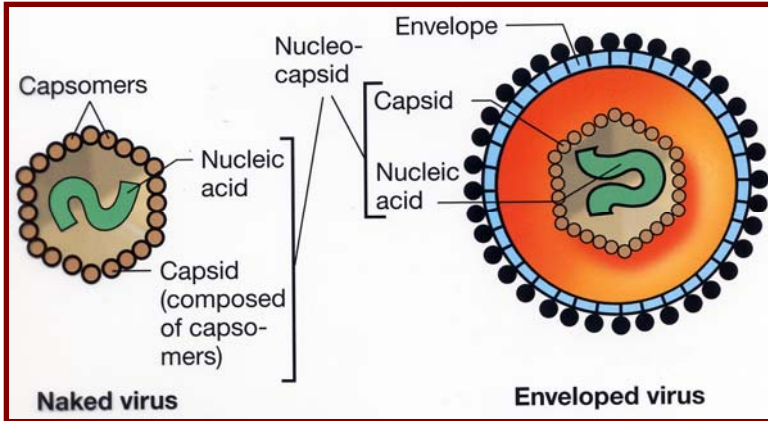
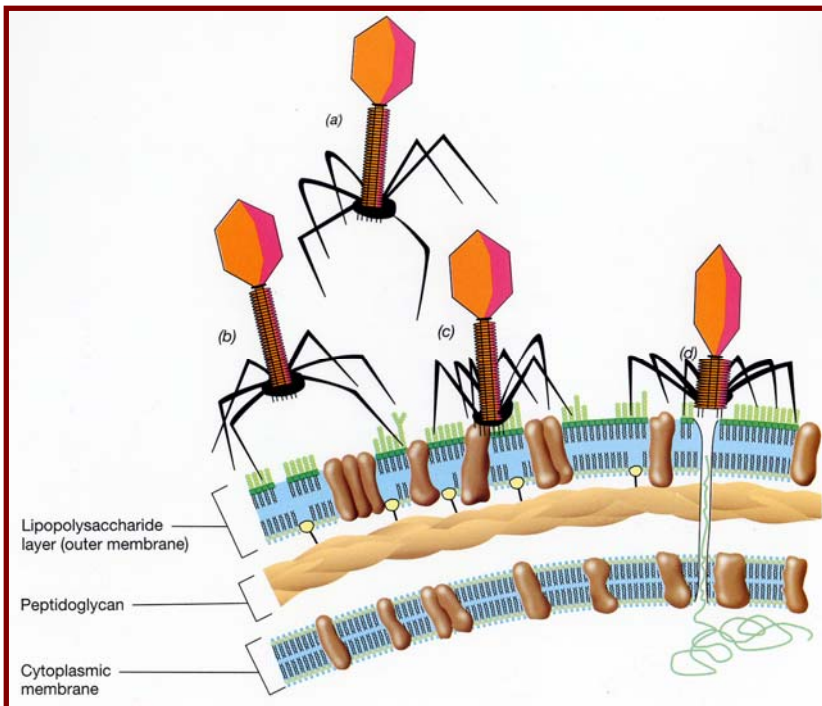
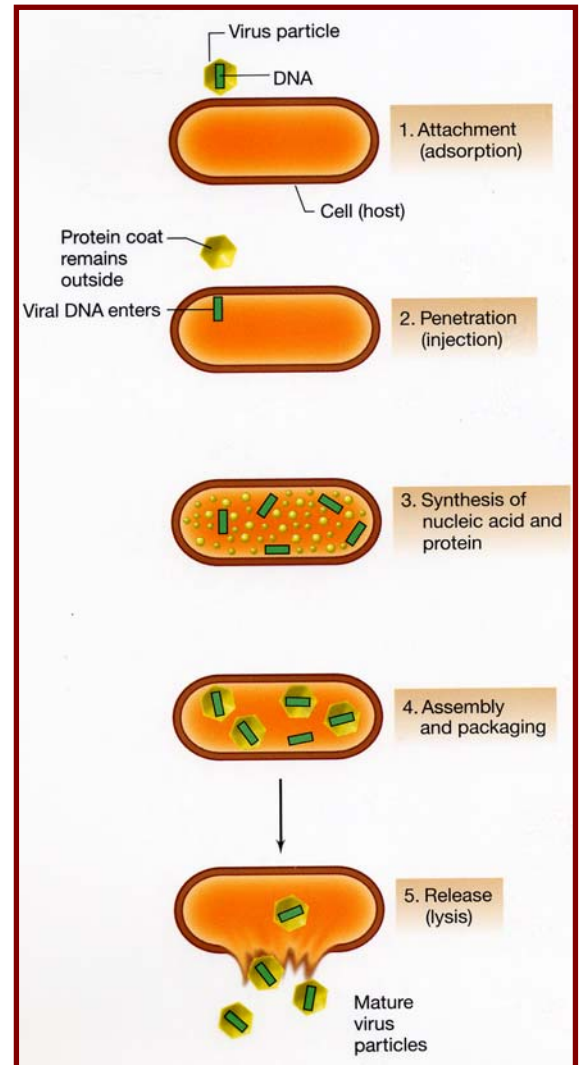
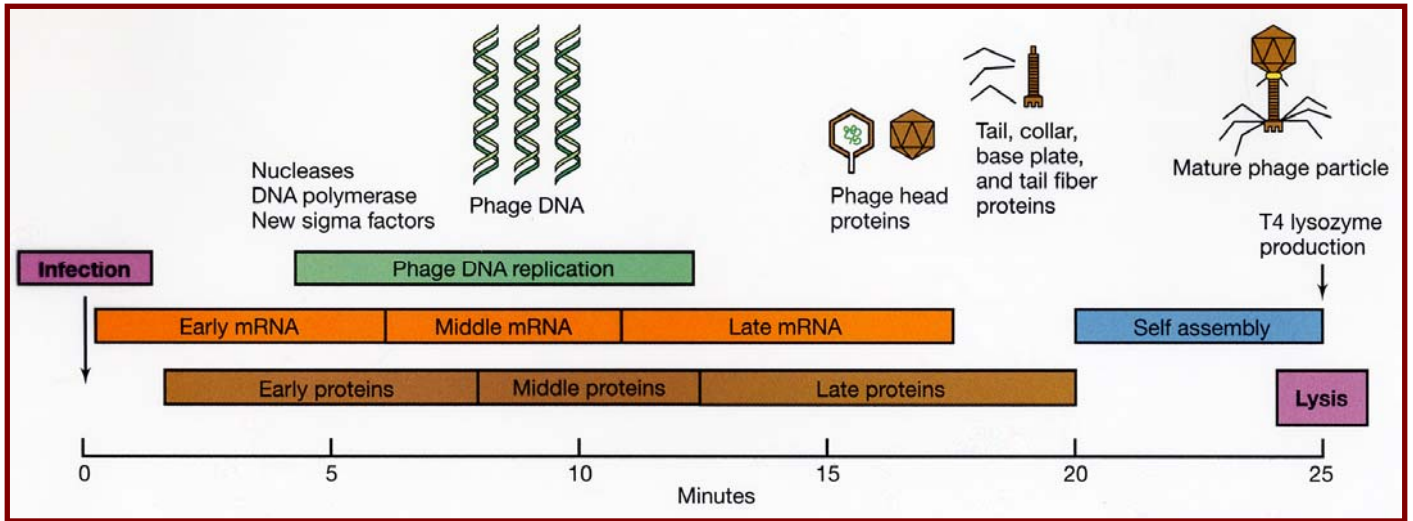


Figure 9.2 An example of the arrangement of virus nucleic acid and protein coat in a simple virus, tobacco mosaic virus. (a) Electron micrograph at high resolution of a portion of the virus particle. (b) Assembly of the tobacco mosaic virion. The RNA assumes a helical configuration surrounded by the protein capsid. The center of the particle is hollow.

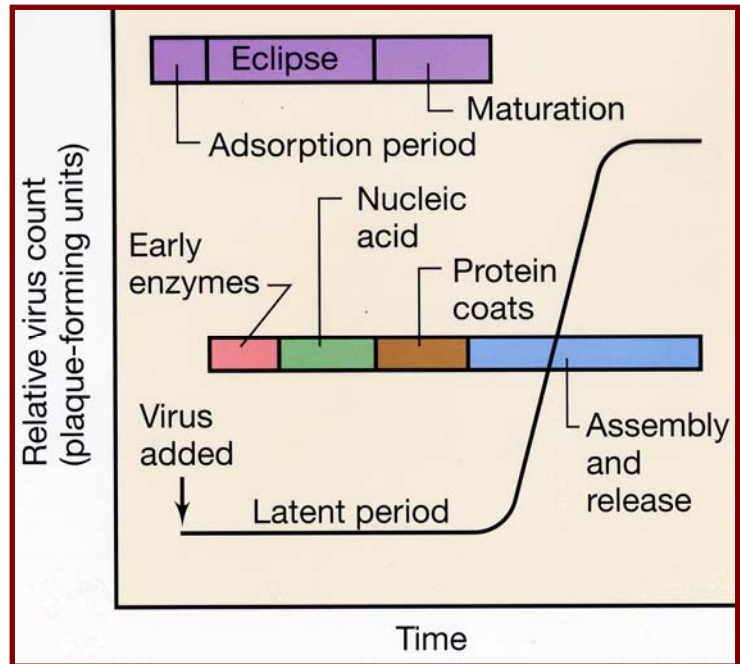
- The infection process
 - Attachment
 - Simple bonding to receptors
 - Random event
 - Penetration
 - Complex process to get the genetic material into the cytoplasm



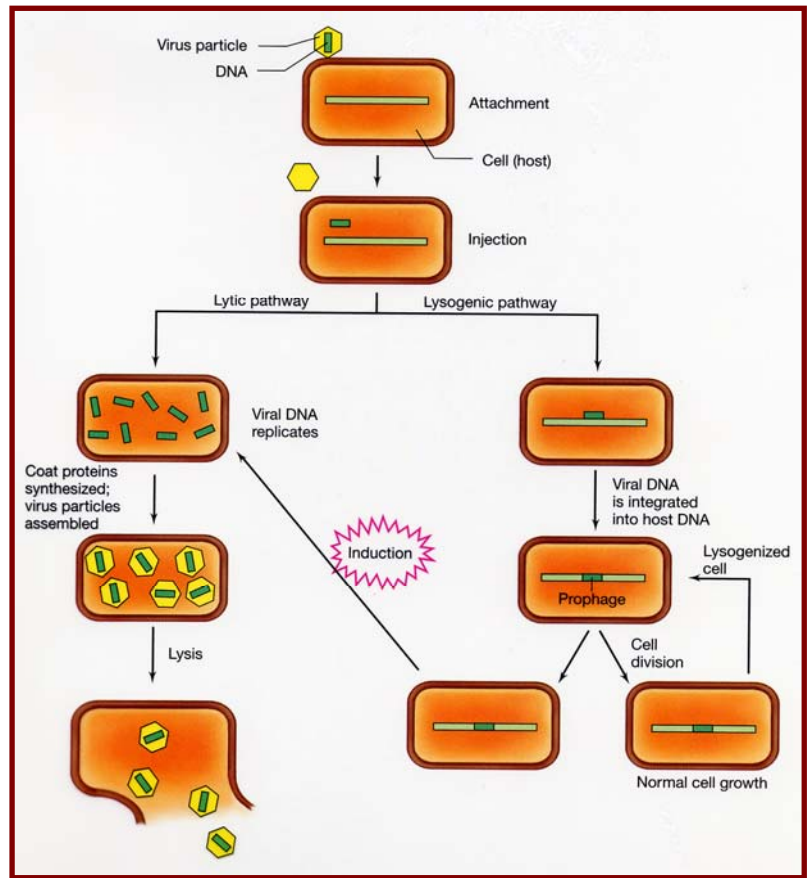
- Replication
 - Early
 - Redirection of metabolism to viral nucleic acids and proteins
 - Late
 - Structural proteins
- Assembly
- Release
- Reproduction is rapid



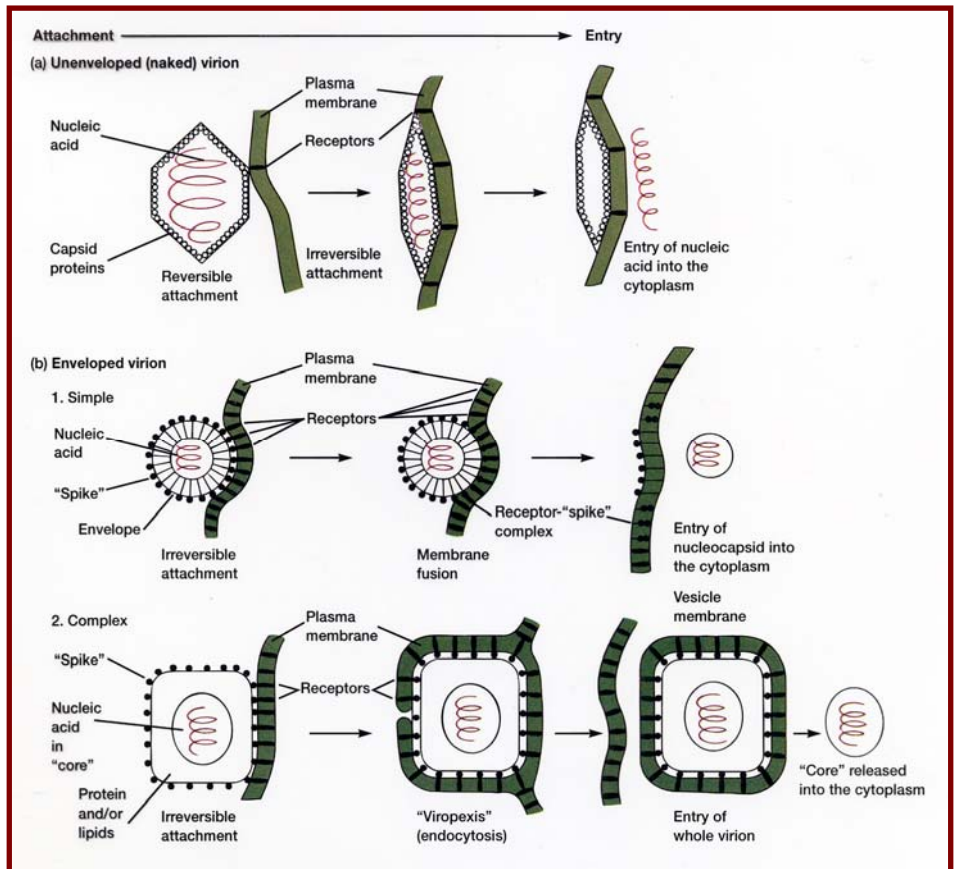
- A one-step growth curve

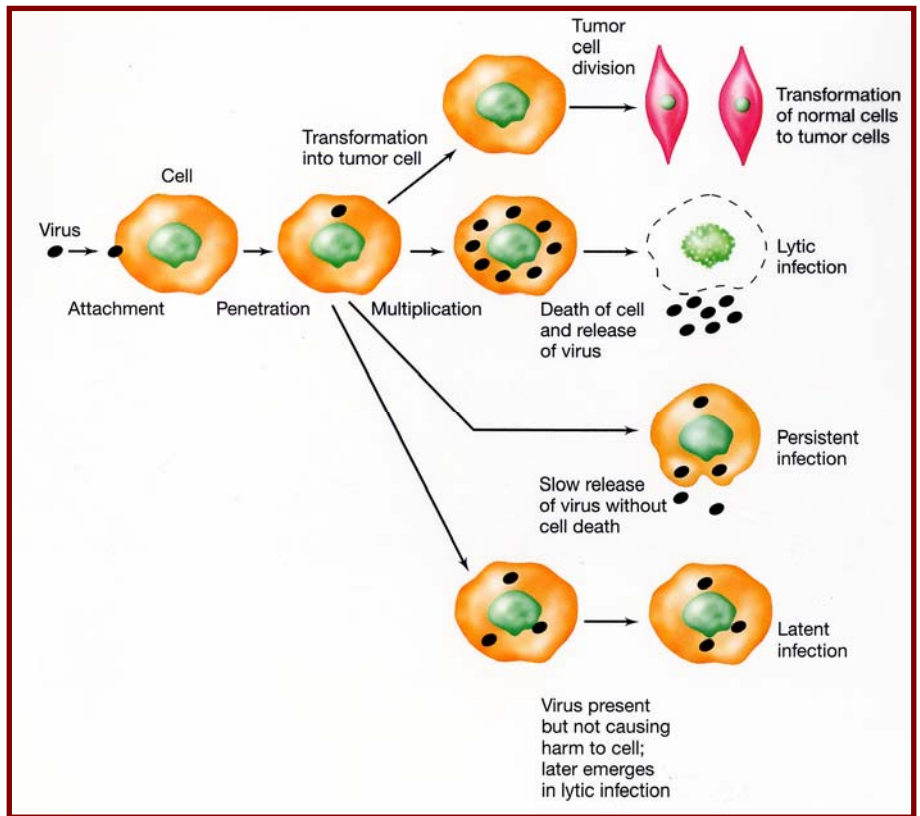


- Infection does not always result in death.
 - Virulent viruses
 - Kill the host cell
 - Temperate viruses
 - Genetic material ends up incorporated into the host genetic material
 - Now known as a lysogenic virus and the host bacterium is lysogenized
 - In the lysogenic state the viral genetic material is termed a prophage



- Some things about animal viruses
 - Remember eukaryotic cells have organelles so there is a compartmentalization of biosynthesis
 - There are no rigid cell walls for the virus to deal with
 - Basically the patterns of infection are the same as for bacterial virus
 - But the potential outcomes may be quite different (Figure to the right from Prescott 1993)





Viroid and Prions

- Viroids
 - Small circular, single-stranded naked RNA molecules
 - A number of important plant pathogens are viroids
- Prions
 - Extracellular form is entirely protein
 - Appear to modify an existing protein commonly associated with neurons
 - Infectious and infection results in more copies of the protein
 - Bovine spongiform encephalitis, Kuru, and Creutzfeldt-Jakob disease are common examples of prion infection

→ All figures except where noted, are from Madigan et al. 2002, 2005.

References:

Madigan, M. T., J.M. Martinko, and J. Parker. 2002. Brock Biology of Microorganisms 10th ed. Prentice Hall.

Prescott, L.M et al. 1993. Microbiology 2nd ed. Wm. C. Brown.